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Rehabilitation of hearing is considered in five conference papers. Two papers come from Poland: "Rehabilitation of Hearing in Children 'Deaf' in First 5 Years of Age" by D. Borkowska-Gaertig and others and "Possibilities of Hearing Improvement in Adults with Conservative Methods" by T. Bystrzanowska. Also included are "Re-Education and Demutization in Belgrade Specialistic Medical Centre" by T. Ilitch of Yugoslavia, "Ear Improving Operations on Children" by W. A. Fedorowa of the U.S.S.R., and "Modern Acoustical Rehabilitation of the Deaf" by O. Bentzen of Denmark. (JD)

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Rehabilitation of Hearing

Selected Papers from the Fifth Congress of the World Federation of the Deaf Warsaw 1967

compiled by
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Preface

Rehabilitation of Hearing is a collection of 5 papers selected from those presented at the Fifth Congress of the World Federation of the Deaf, Warsaw, 1967. These papers were collected and compiled by the Alexander Graham Bell Association for the Deaf, Washington, D. C. Other collections of papers from the Congress have been compiled and are available from the ERIC Document Reproduction Service. Other collections announced in this issue of Research in Education may be found by consulting the Institution Index under World Federation of the Deaf or the Subject Index under aurally handicapped. Titles of these other collections are:

Communication Methods for the Hearing Impaired
Cultural Activities for the Deaf
Diagnosis of Hearing Loss
Education for the Hearing Impaired (Auditorily Impaired)
Psychology of Deafness
Sociological Aspects of Deafness
Training and Qualifications (Teachers and Workers for the Deaf)
The Very Young Hearing-Impaired Child

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Modern Acoustical Rehabilitation of the Deaf. Ole Bentzen

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REHABILITATION OF HEARING IN CHILDREN "DEAF" IN FIRST 5 YEARS OF AGE.

/A paper/

Results of press poll gathered in 1963 disclosed that only 1 % deaf children and 4 % with serious auditory defects used hearing aids at that time in Poland. This has not been caused by manufacturing or financial reasons and was due to:

- lack of consultation facilities for all the children with auditory defects;
- lack of adequate methods of examination of impaired hearing in children of infantile age;
- lack of methodology of development and rehabilitation in infants during a very important period before development of speech.

In the years 1964-65-66 and 67 there was marked improvement because Polish Association of the Deaf assisted by Health Service organized 14 Consulting Centres for children with auditory defects all over the country x/ while Children Otolaryngology Clinic and Central Consulting

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x/ Partly on basis of cooperation of Scientific Council of the Ministry of Health and Social Welfare with Children's Bureau MHEW, proj.No.WA-CBS Mother and Child Institute

Audiologic-Rehabilitational Department of the Institute for Mother and Child works on complex and multispecialistic principles of diagnostics and rehabilitation for children with impaired hearing.

Social assistance.

Consultation and care for children with auditory defects is free of charge in Consultation Centres conducted by P.Z.G. /Polish Ass'n of Deaf/ and Central Consulting Department of IMD /Mother and Child Institute/. Every child since infancy may obtain a hearing aid against physician's prescription. Hearing aids are given free of charge to parents of all children covered by social insurance; they constitute 2/3 of population and 1/3 of them buys the devices at a price equal to about half monthly wages of skilled workman. Hearing aids are manufactured in Poland by "Omig" company but in special cases are imported from Denmark /Oticon" make/, Austria /Vienaten Co./ and the Soviet Union - mainly osophones. After 3 years' activity of the Consulting Centre statistics comiled by Polish Ass'n for the Deaf show that the number of children under its care is steadily increasing. All introduced facilities caused that by 1966 25 % registered children and their parents established contact with specialistic consultants of the Centre.

From those statistics appeared however that there are difficulties due to the lack of specialists viz.: logopedicians, psychologists and physicians collaborating with the Consulting Centres while many were caused by parents when undertaking rehabilitation work on afflicted children.

After analysing those difficulties it was decided to limit, for a time being, rehabilitation activity in proportion to financial and personnel possibilities concen-

trating on rehabilitation of infants up to 5 years old, especially by means of hearing aids. Thus a certain group of children not rehabilitated by the environment of their own would be given possibility of auto-rehabilitation by hearing. Therefore a group of children not more than 4 years old has been organized and give special care.

Audiologic Treatment.

In order to provide hearing aids for all needed children following procedure was outlined:

- trial equipping with a hearing aid every child since infancy or from the moment when hearing was impaired because in children under four detailed audiologic diagnostic examinations are impossible before application of hearing aids.
- every child is given individual insert for external auditory meatus in both ears in order to test hearing aids in each ear and to protect the child from faulty reception of sounds due to possible feed-back.
- trial equipment with hearing aids begins both for children who do not react to any acoustic stimuli and those who show reaction to loud sounds only according to tests. It often happens that a child during many initial examinations does not respond to acoustic stimuli owing to emotional disorders or retardation of development originating from nervous system. Only after recognizing auditory impressions received during examinations of hearing or by means of a hearing aid, the child begins after certain time to react to sounds.

It is also known that the limen of auditory reactions is being lowered in normally developed and hearing children of one to about 30 dB and only in 3th - 4th - 5th year of age the limen approaches that of grown-ups. To what extent the

maturity of auditory reaction in a child with impaired hearing differs from that one of a hearing child - is not known. We assume however that just as in a hearing child, the process of integration of acoustic stimuli in a child not hearing sounds from its environment, matures together with the maturity of cortex, its hearing centres and association channels. Therefore a child of one, two and three with no hearing reaction adequate to its age and not receiving any sufficient information by means of hearing, socially deaf, is being considered as retarded in auditory development and not as totally deaf one. Admitting also analogy with hearing children in relation to widening of their auditory field as their psychophysical processes develop, we assume that some children one or two years old showing reaction to acoustic stimuli of 50 - 90 dB after a few years of auditory training ought to react to intensities within a range of about 30 dB less.

Obviously such improvement is impossible in children with impaired perception of sounds within Corti's organ.

To estimate its efficiency in children up to 5 years old a method of indirect examination of threshold of pain - "hyperaesthesia dolorosa" was introduced, instead of classical superlimen examinations impossible to undertake at such age.

In children one, two and three years old examination of the threshold of pain reaction is done by means of testing suitability of hearing aids. For that purpose hearing is examined from a free field without a hearing aid and with it employing acoustically standardized changing toys, musical instruments or sounds known to children from everyday life. Measurement is done with Sound Level Meter type MPG 8-S, No. 0,45 made by Howator Co.

In children 3 to 4 years old examination of pain reaction

threshold is done by means of table transistor amplifier with intensity controls for each ear; the instrument as a prototype was designed at the Clinic.
For children 4 - 5 years old two comparative curves of tonal audiometry are drawn through earphones, examining without hearing aid with an earphone and with haaring aid and an earphone put on the microphone of this aid. In this way 2 curves of thresholds are obtained. The distance between them shows the degree of usefulness of the hearing aid for the child /Table 1/.
Examinations of children not yet 3 years old as out-patients are rarely successful. Those children as a rule submit themselves willingly to the use of hearing aids under clinical conditions when they stay several weeks in a ward especially adapted to the needs of children audiology surrounded by staff familiar with the problem.

Aditory Rehabilitation.

As the press poll for "deaf" children disclosed that about 60 % children show auditory defects since their birth and about 30 % within 1-st and 2-nd year of age a scheme of hearing development and its rehabilitation was worked out for children from 6 to 48 month old.
Auditory trainings beginning early are to help in forming speech in small children with hearing defects.
The scheme is divided in 2 periods:
I - passing coding of auditory concepts and
II - active reproduction of coded auditory concepts /decoding/
During the I-st period the child is helped with a hearing aid:
1. To recognize passively, to code through subcerebellar and cerebellar centres
- human and animal voices,

- toys and objects of everyday use, and
- noises of surrounding environment

2. Next the child undergoes training in association processes connected with auditory stimuli:
- by associating auditory signal with an object, a person, a toy, a picture,
- by associating auditory signal with rythm, pitch, colour of transmitted tones and acoustic stimuli,
- by associating auditory signal with air vibration, sound emitting objects, vibration of own and that of another person's oso-cartilaginous system,
- by associating auditory signal with verbal order together with reading lip language and without visual control.

3. Next, more difficult stage is the differentiation of auditory concepts. For that purpose training exercises are introduced in order to differenciate voices and noises from the environment, sounds of various musical instruments, sounds of different rythm, intensity, frequency, timbres and melody.
Using sense of touch the child may differenciate various intensities of vibrations and resonances.

II. Only after such exercises we may begin attempts of reproduction of coded auditory concepts.
- reproduction of rythm on toys, instruments, gramophones, tape recorders and by means of own organs of movement and own voice.
- reproduction of resonance vibrations /by feeling/ caused by objects emitting sounds /acoustic pressure/, instruments, radio loud-speakers, etc; reproduction of vibrations of oso-cartilaginous system by means of own larynx and "mask" /base/.
- reproduction of environmental human sounds /laughter, crying, shouting, singing, words/ and those of animals,

- reproduction of pitch by modulating wireless sets, tape recorders, amplifiers for hearing rehabilitation, by means of own voice,
- reproduction of frequencies by means of changing toys, ordinary objects, musical instruments and with own voice,

After such preliminary exercises conducted over one, two or three years depending on age and development possibilities of the child - spontaneous reproduction of verbal signals might appear.
Auditory rehabilitation scheme is adapted for a child under home conditions under the guidance and periodical control by a physician from Consultation Centre. For rehabilitation exercises at the Centre sounds of everyday life from child's environment were tape recorded and out of them sounding scenes were composed. Those scenes contain acoustic signals from such real situations which every child ought to know to be protected against danger e.g. sound of car brakes, tram bells and to recognize and understand such sounds as door-bell, barking dog, human laughter and crying. Sounding scenes are illustrated with appropriate pictures, toys and photographs in order to enable association of vocal image with visual one and with situation of everyday life.

Results of polling about children with hearing aids.

After one year of rehabilitation activity covering children with hearing defects under 5 years of age for the purpose of analyzing the results a questionnaire has been sent to all the children from 1 to 14 years old and registered at the Consultation Centre as being under rehabilitation care. For comparison the results were divided into 2 groups: Younger children 1 to 5 years old and older ones 6 to 14 years old.

61 % children returned questionnaires properly filled out, covering 15, of /1/ the group of younger children and 166 of /2/ older ones. The results of polling in both groups of children are shown on Tables I and II.

Table I

Children with hearing aids and with individual ear insertions

Group total number of children	Possession of prescribed hearing aid		Hearing aid		Hearing aid		Individual ear inserts	
	yes	no	Polish	foreign	Health Service	Privately	yes	no
1/151	132/88%/	19/12%	125 /83%/	8 /5%/	117/78%/	16 /10%/	146/97%/	5/3%/
2/166	157/94%/	9/5%/	142 /85%/	15 /9%/	132/79%/	25 /15%/	162/98%	4/2%/

The results show that 88 % children in Group 1 and 94% in Group 2 received hearing aids prescribed by physicians of Consultation Audiologic-Rehabilitational Centre of Mother and Child Institute and in Consultation Centres of Polish Association of the Deaf all over the country. 83% to 85 % children use hearing aids of Polish make /Omig/ and 5 % to 9 % of foreign make /mainly "Oticon"/. The data show also that both groups of children were provided with ear inserts by the Centre quicker than with hearing aids by Central of Medical Equipment. Considerable achievement of the deaf from economic and social point of view is the fact that the data show that 80 % children in Poland receive hearing aids free of charge.

Table II

Hearing aids used by children being 2, 3, 4 and 5 years old and 6 to 14 years old

Age no.of children having hearing aids	Using hearing aids			Reasons for not using		
	total	From 1/2 hour to 3 hours	Whole day	technical	personal	unknown
2/3	1	1	-	1	1	1
3/28	25 - 89%	22 - 88%	3 - 12%	3 - 11%	6 - 22%	9 - 32%
4/50	39 - 78%	38 - 97%	1 - 3%	9 - 18%	11 - 22%	21 - 42%
5/51	36 - 70%	33 - 92%	3 - 8%	15 - 30%	19 - 38%	16 - 32%
2 - 5/132	101 - 76%	94 - 93%	7 - 7%	28 - 21%	37 - 28%	49 - 37 %
6 -14/166	107 - 71%	94 - 87%	19 - 18%	60 - 37%	50 - 32%	30 - 18%

The above Table shows that from 71% to 76% children in younger and older groups make use of hearing aids owned by them. In those groups the largest percentage namely 90 % uses hearing aids being 3 years old. Considerable majority in both groups, particularly younger ones, uses the aids for a short time only and less than 3 hours daily. Difficulties in profiting from hearing aids are reported by parents in both younger and older groups. The troubles arise due to technical reasons viz.: frequent defects, device being out of order and not exchanged for new one, difficulties in charging spare bateries and unskilled handling. Difficulties of this kind affect 21 % younger children and 37 % older ones. Frequent troubles are due to different reasons and parents report many of them at the same time why a child according to their observation refuses to use the device, uses it for a short time only or unwillingly. On the other hand such difficulties which may require audiologic handling like e.g. narrow auditory field and hyperacusis dolorosa, psychogenic reasons as e.g. emotional disorders or negative reactions due to educational and rehabilitational errors of family environment were reported in 28 % cases of younger children and in 32 % of older ones. Unknown reasons were given by 37 % parents of younger children and 18 % of older ones.
Results of polling show also that auditory rehabilitation in 45 % younger children and in 25 % older ones is taken care of by the Consultation Centre. The remaining children are the cases of auto-rehabilitation i.e. spontaneous and automatic registration by a child all the acoustic signals from its surrounding with the help of hearing aid amplifier.

Summary.

Auditory rehabilitation in children with serious hearing defects is conducted in Poland:

1/ by organizing provincial rehabilitational Consultation Centres of Polish Association of the Deaf with methodical and scientific assistance from Otolaryngological Clinic of Mother and Child Institute.

2/ by early diagnosis of hearing disorders applying auditory tests fixed by multi-specialistic team of the Centre,

3/ by early beginning of rehabilitation of hearing with the help of organizational and social facilities of State Health Service with the assistance of methods of audiologic treatment and principles of hearing development worked out by the Clinical Staff.

As result of one year's work introducing care over children with defective hearing up to 5 years old all over the country, auditory rehabilitation scheme included all reported children. Basing on orientative polling data considerable progress is shown in providing children with hearing aids /88 % questioned/ and in their use by age group up to 5 years old /89 % device owners/.
About 80 % children received hearing aids free of charge. Considerable difficulties arising from using and handling hearing aids are of technical, audiological, psychological and social nature. Resulting from those difficulties as many as 95 % profit from auditory rehabilitation during only 1/2 hour till 5 hours daily. Such situation requires further increased efforts of technicians, audiologists, psychologists and also sociologists and pedagogues.

V KONGRES ŚWIATOWEJ FEDERACJI GŁUCHYCH – WARSZAWA 1967
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POSSIBILITIES OF HEARING IMPROVEMENT IN ADULTS WITH CONSERVATIVE METHODS

/The Paper/

Adults may suffer from hearing impairment since birth or since early childhood – with consequent speech disturbance, which could not develop in a natural way. Hearing impairments could have developed also later, in adolescence or adult's age when speech and language were established. Speech ability is then retained, although it is less melodius, monotonous, with a varying, frequently inadequate intensity.

The possibilities of hearing improvement are related to the characteristics and degree of deafness. Pure conductive deafness is not a severe one, the hearing loss does not exceed 60 db, perception of loud speech is possible and can be relatively easy improved or compensated. It appears commonly in consequence of otitic or adhesive disorders of the middle ear or in consequence of otosclerosis. A greater hearing loss appears in cases of mixt deafness, where beyond the sound conductive organ lesion occur disorders of the sound receptor, most frequent in the middle ear or of the auditory nerve. These may be consequent to an inflammatory or degenerative process /otosclerosis/ which involved the middle ear, or to two coexisting affections of a parallel course in the conductive and perceptive organ /i.e. otitis media and toxic lesion of the auditory nerve VIII/.

Severe hearing los, leading to complete deafness is always consequent to the sound receptor's disorder: the lesion may each segment of the peripheral part of the sound receptor, therefore the middle ear and nerve VIII up to his nuclei in the medulla oblongata. Lesion of the central nervous system leads exceptionally to complete bilateral deafness, which appears only in diffused brain lesions subsequent to inflammatory cases and development failures, but then other concomitant neurological symptoms appear. We must underline, that only bilateral deafness is decisive in classifying social disability. Unilateral deafness, even a complete one, handicaps hearing capacity only in a slight degree, but it may, however, render some professional work impossible. The evaluation of hearing loss in unilateral deafness does not exceed 12%. The greatest chances of hearing improvement are in cases of the sound conduction organ disorders. A large range of operational procedures is of great importance - a detailed report is given in another paper. In some cases there is a chance to obtain hearing improvement just with small procedures, as persuflation of the auditory tubes introducing drugs improving their permeability, or having a lytic influence on the connective tissue of the middle ear region. Those are the means and ways to introduce into the auditory tube and into the tympanic cavity suprarenal preparations, mostly hydrocortizone, sympathicomimetic drugs like ephedrine, pryvine or proteolytic enzymes like alpha-chimotrypsine. The last one may be introduced into the tympanic cavity by transtympanal administration after paracenthesis of the tympanic membrane. In the course of hearing impairment of long duration, with a hearing loss of 50-60 db, this treatment gave a hearing improvement up to 30 db, admitting the reconstruction of social capacity. We know, that to understand every-day speech and to percept the majority of sounds of the environmental world, a hearing intensity level of 30-40 db at frequencies from 500-4000 Hz is sufficient.

In deafness of conductive type an improvement may be obtained with a careful and systematic treatment of the superior respiratory tract s infections, especially nasal catarrh and sinusitis, by prophylaxis against allergic infections and their treatment, by eliminating infective centres of the tonsils and teeth. These centres infect the middle ear, make it allergic and cause toxic lesions of the receptive organ. Further hearing loss of 10-20 db, consequent to nasal catarrh cahnges, may cause an increase of the critical limit of 40 db and create a subjective perception of deafness. A relatively small hearing improvement reconstructs its capacity.

Conductive and mixt deafness, which are not subject to treatment, is rather easy to improve when using hearing aids, and this will be further discussed.

Receptive deafness presents a much more complicated problem. This type of deafness - at present - is completely inaccessible for surgical treatment. Chances of conservative treatment are as well limited to seldom cases. They concern newly onset cases of sudden and rapidly increasing deafness of known etiology. I am considering here cases of deafness due to infection, toxicity, when a rapid and energetic treatment with high doses of antybiotics of a large range of activity, with an associated administration of glycocortycoides and salicylans gives sometimes good effects, a complete or nearly complete return to normal audition. Usually a more or less marked hearing loss for high tones remaines, but this has no - or nearly no - influence on speech comprehension. This group includes also deafness consequent to vasoconstriction in the region of the internal auditory tube or its cochlea-branch. These disorders appear in people with an usteady vegetative system, sometimes in the course of arterial hypctension /not so frequent in hypertension/, after sudden changes of temperature, of atmospheric tension, after mental emostions. The treatment is based on complete tranquility and repose, on administration of vasodilating drugs, like: ergotamine,

teobromine, belladonna, drugs of protective action on the central nervous system - atarax, glimid, meprobamath, elenium etc. /to avoid central vasomotorial stimuli/ and neurotropic drugs, like: vitamin B1 and B12 in high doses. Considering that deafness consequent to vasoconstriction is difficult to differ from other deafness of vasoprovenance /because of extravasation or thrombosis/, this treatment is often ineffective.

Toxic hearing-disorders due to the effect of some drugs /a typical example is dihydrostreptomycine and quinine/ are rarely reversable: sometimes an improvement occurs after the administration of antotoxic drugs like BAL /British Antiluisit Factor/, and neurotropic drugs, mainly vitamin B1 and B12, strychnine and vitamin A in a high dose. As support treatment may be administered injections of Biostymine or placenta as biostimuli of Filatow. Treatment of deafness due to other intoxication is a less hopeful task, and mainly in consequence of the frequent toxic action of nicotine. Is not subject to treatment deafness due to an accoustic injury, either a severe one - consequent to an explosion of detonation, or more frequently - a chronic one, caused by professional disorder due to noise. Deafness due to cranial trauma is only reversable when it concerns the sound conductive organ. When the sound receptor is injured - because of extravasation into the labyrinth or the continuity-interruption of the auditive nerve VIII occurs - deafness is irreversable. Nor are we able to combat effectively senile deafness, being one of the symtoms of increasing biological insufficiency of the organism, consequent to the degenerative process. The known aphorism "The man is as old as his vessels" concerns as well the vessels of the internal ear.

In all the mentioned types of deafness, the gravity centre concerns not the treatment but their prophylaxis. Avoidance of toxic condiments, careful control in case

of ototoxic drugs administration necessity, reduction of the noise in production process, and in life conditions, professional prophylactic and control examination of the audition, proper diet and way of life, retarding the pernicious effects of old age, protection of the circulatory system, diminution of the every-day life stress and immunization against stress - those are the conditions reducing the exposure to deafness.

A separate group presents psychogenetic deafness, called also inorganic or functional. This is a partial or complete hearing loss following psychic emotions, conflict situation in psychopatic subjects with abnormal mental reactions. This kind of deafness, properly diagnosed, ought to be treated by with psychotherapy: a suitable proceeding and abolition of the causal factors lead to a complete return of normal audition.

The limited treatment possibilities in receptive deafness, require a greater effort from the rehabilitation methods and prosthesis. Rehabilitation methods, concerning adults using speech and understanding language, must adapt, first of all, lip-reading education and make use of other senses - principally - visual and tactile. Teaching language in adults deaf from birth or since early childhood - is ineffective. Therefore, the hearing and language rehabilitation must be stronger accentuated since early childhood.

For people with a certain hearing rest, adaptation to hearing aids plays a significant role. In the limits of hearing handicap, hearing aids ought to have the same meaning as eye-glasses in eye-sight disorders. Unfortunately, the hearing aids have not gained as yet the same common law like eye-glasses. The adaptation of hearing aids has great difficulties to surmount, arising from the unskilfulness in using them, and besides, the desire to conceal the handicap. Not for all types of deafness may be adapted the same criteria of instrumentation. Cases of

conductive deafness, which present only a feeble hearing impairment without qualitative changes are the easiest to obtain hearing improvement, a simple amplification leads to improvement of the perception. The situation in receptive deafness is much more complicated, especially receptive deafness resulting from the disorders of the internal ear /cochlea/. In those cases, besides a quentative decrease of the percepted sounds, their quality varies. This is consequent to their abnormal and unequal perception of the loudness of some sound factors /words/ in relation to others. Therefore, a sound of definite composition, the word itself, becomes hardly comprehensive, and amplification by a hearing aid augments this disproportion between the particular factors and makes the comprehension more difficult. Such cases necessitate complicated and therefore more expensive hearing aids amplifying the sounds selectively. Sometimes, even, you must resign from using a hearing aid. Also in perceptive deafness with a significantly decreased perception of high tones, hearing improvement is insufficiently effective. Obtainement of a sufficiant amplication with a hearing aid of these high tones,basal in speech comprehension, is then unsuccesful.

The hearing aid requires a certain adaptation of the hard of hearing subject and this is more difficult and of a longer period the longer is the duration and the deeper is the deafness. A normal hearing man, besides the sounds he intends to hear and of which he is aware, percepts a whole range of accompanying sound which he eliminates from his consciousness in spite of their high intensity sometimes. These are i.e.: the traffic, the wind blowing, the environmental conversation noise. The hearing aid amplifies all the sounds, not only the intentionally heard ones. For a man which suffers of hearing impairment since a long time, and is accustomed to live in a world of calmness, the accompanying sounds are untolerable disorders which he did not expect and

which he has forgotten, therefore he must adapt his mental process to eliminate them. Further, in severe-deep deafness even high amplification permits to reproduct only fragments of words, which according to psychical integration give known sound symbols. Since the adaptation and integration capacity decreases in course of years, prosthesis of older people faces more difficulties. A disagreable obstacle is also the resulting noise of the hearing aid, and the whistling consequent to retroaction when the microphone is excessively approached to the earphone.

The hearing aid, like each technical construction, requires using knowledge and a proper conservation. Besides there are many types of hearing aids having different possibilities of amplification and of selective intensity regulation. The choice of a hearing aid can't be based only on the audiometric curve, but you must take into consideration as well the capacity of adaptation, of integration, the intelligence level, and in a certain degree, the technical capacities of the deaf. Therefore the choice of the hearing aid must be very careful, it must be chosen individually, using every-day speech and applying even verbal audiometry from a free field. The earphone of the receiver must be very well fitted. After having chosed the hearing aid the patient ought to be for some time under the care of a specialistic centre, which help him during the difficult period of adaptation. In severe deafness, the hearing aid, even if it does not permit language hearing, it helps its comprehension by association of visual stimuli in lip reading and audition stimuli formed by words fragments.

During the recent years the production and adaptation of hearing aids have gained a great progress. Hearing aids for both ears permit stereophonic hearing, more adapted to normal. It must be underlined that in severe deafness, requiring a high amplification, an adaptation of larger hearing aids - type box - is necessary, containing more tran - sistor elements amplifying the sounds. Therefore the tendency to produce miniature hearing aids can't match with

their efficiency augmentation. Small hearing aids like ear contours, hair-slides, or located in aural concha admit only a feeble amplification. Cosmetical regards can't dominate the acoustic needs in the choice of a hearing aid.

The last word in the region of conservative hearing improvement has not been pronounced yet. The future belongs undoubtedly to prophylaxis, to prevention of deafness. Prevention against traumata mass epidemic consequent to war, production-noise diminution, decrease of infectious diseases morbidity, retardation of the senile process by a rational way of life, elimination of drugs side effect, reduction of the administration of condiments - are the means preventing handicap. We must consider, that the process of surgical technics will permit to interfere in some cases of perceptive deafness - by decrease of the internal ear pressure, decompression of the nerve VIII etc. Some experiments are already made in this field. The progress of pharmacotherapy will surely influence the chances of treatment in infecticus or toxic deafness. In cases of irreversable deafness the possibilities of hearing improvement and of dehabilitation will be based not only on further perfection of the typical to-day hearing aids, but will aim to profit of other suppositions, such as. change of speech frequencies to make a profit of hearing rests only in the limit of low frequencies, a larger profit of vibration to substitute auditory impressions, use dermal detectors to substitute the pernished hearing sense by the tactile sense.

The great progress of science and technics will not remain without influence in the field of improvement and compensation of the injured acoustic organ.

V KONGRES ŚWIATOWEJ FEDERACJI GŁUCHYCH – WARSZAWA 1967
V Congress of the World Federation of the Deaf – Warsaw 1967
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Med.-Aud.-35

RE-EDUCATION AND DEMUTIZATION IN BELGRADE SPECIALISTIC MEDICAL CENTRE

/Summary/

We should like to draw attention of the participants of this Congress to our contribution and achievements in the field of theoretical and practical re-education and demutization of the deaf and hard of hearing. The most important thing in arriving at a system of education of those people is, first of all, searching for limina or the remnants of hearing. Such examinations present sometimes problems difficult to solve. If is not known whether it is a case of organic deafness, what are audiometric characteristics, or whether the retardation of speaking ability passes into other field /neurological, psychologic, intellectual/ which could be easily identified with total deafness in a child of preschool age. If actually during different examinations of hearing distinct changes of hearing limen are found then it might be suspected that it is a case of total pseudo-deafness. In such case the anomalies may result from perturbances of perception, verbal deafness and, most frequently from asymbolia, having absolutely no relation with the sense of hearing. In our specialistic centre we use as diagnostical means various audiometric tests both tonal and vocal, psycho-galvanic reaction, etc. Recently we make use of data of cerebral

audiometry which permit us often to confirm previous diagnosis and which in certain cases may lead to topographic diagnosis of impairment of hearing. In case of diagnosing a damage to internal labirynth we refer to electrostagmographic findings. It is clear that to arrive at a differentiated diagnosis cooperation of many specialists is required; thus child's behaviour is observed by an ethologist and audiologist, further it is also interesting to psychologists, psychiatrists and neurologists let alone pediatricians and otophonists. After finding that a child is deaf we try to apply methods of education of hearing placing great hope in ampliphiers. This education of hearing, when precisely and well conducted, brought considerable results in many children as far as recognition of vocal language, improved pronounciation, voice, rythm, etc. are concerned.

But in case of a deaf child, the problem remains and still is not solved; often it comes to this that the education of hearing does not bring any results. In cases when such education based upon application of an ampliphier adapted to the degree of deafness does not give expected results, we resort to re-educational perception which bases on giving nature of sensory impressions to everything which in reality is totally different. For that purpose the sense of touch and vibrational contact could be taken advantage of, basing on presence or lack of guttural sonancy. Phonetics and, in a more general way, linguistics participate toward comprehension of speech and practical preparation and re-education of the deaf or hard of hearing. Phonetic reasons are known to be the results obtained through auditory preparation of deaf children permitting them nevertheless learning acoustic language even when identification of words follows a serious impairment of the ear. We apply instruments which a character of visual impressions to various aspects of language. Thanks to electro-acoustics we have learned about the acoustic structure of sonic material composing human speech.

Oscillograph permits to distinguish differences between phonemes. We use Kay sonograms. Sound is presented in form of differently located spots depending on components of frequency and development in time. Recently we have introduced audio-visual technique based on filtres designed at our Institute for practical training of the deaf.These are filtres of speech; they permit the afflicted to hear the speech and phonemes by moving rather narrow tapes and on the other hand by adding those tapes in order to hear "what is going on". Application of oscilloscope or phono-audioscope permits simultaneous or successive use of visual, phonic and tactile impressions. An analyzer of frequency may be added which permits building interesting visual and sonic structures. After experiments lasting many years we are inclined to think that education having for its purpose learning speech by a hard hearing child is based on patience, and work which do not offer hope of spectacular progress but on the other hand should not lead to undesirable resignation. Our efforts to provide speech for deaf children ought to be continued and aimed toward making use of even the slightest remnants of hearing.

V KONGRES ŚWIATOWEJ FEDERACJI GŁUCHYCH – WARSZAWA 1967
V Congress of the World Federation of the Deaf – Warsaw 1967
V Congrès de la Fédération Mondiale des Sourds – Varsovie 1967

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EAR IMPROVING OPERATIONS ON CHILDREN

/Communication/

The success in development of optics and instruments, the use of highly effective antibiotics allowed to reach great progress in functional surgery on ear of grown-up persons. But the possibilities to use operations for hearing improvement on children rests up to the present time insufficiently studied.

However, the prevention or elimination of children's hardness of hearing has not only the medical but a very important social meaning.

The importance of normal hearing function during the speech formation and education is well known.

The possibility of normal contacts between children during this period determines their interests forms their personality.

In the literature there are only the separate statements about hearing improving operations in cases with children who have otosclerosis or adhesive middle otitis. More informations were published about hearing improvement operations among the children having the middle ear anomaly developped. In the children's clinical department of Moscow scientific research E.N.T. Institute at Ministry of Health of the R.S.F.S.R. the operation on stirrup in case of adhesive middle otitis and otosclerosis were being carried out since 1965.

There have been made 40 operations on children of 6-15 years old.

Except the commonly used clinical investigation the children as a rule, were consulted by logopedist. One should note that the worsening of children's hearing leads to development of so called "hard of hearing speech", i.e. non modulated, emotionally almost colourless.

5 children were operated on otosclerosis, two of them had operations of both ears, on adhesive middle otitis were operated 24 children 9 of them were treated for explorative tympanotomy. Two children out of the latter group had anomaly of hearing bones development combined, in all probabilities, with Kochlear neuritis, the chain of hearing bones was flexible in 7 cases, and the transmission of perilymph motion to round slot was not disturbed.

The operations on adhesive middle otitis and otosclerosis were carried out according to generally accepted evidence. The main condition allowing to admit the favourable prognosis of operation was presence of air gap in the band of vocal frequencies not less than 25-30 db.

All children had well pronounced hard hearing with function disturbance, both the sound-conducting and sound-receiving devices.

The relative frequency of diagnostic tympanotomy in childhood is explained by the fact that children have such a form of Kochlear neuritis at which the hearing function investigations by audiometer develops the rise of threshhold of bone and air sound conductivity along the whole range of frequencies with a gap between them in 30-40 db.

The attention is drawn to difficulty of differential audiological diagnostics of such a form of Kochlear neuritis with anomaly of middle ear development, adhesive middle otitis and otosclerosis. When treating the case with adhesive middle otitis, the necessary provision of successful operation, except corresponding audiological indications is the absence of pus discharging for a period not less than a year. Besides, an importante role plays the passability of Eustachian tubes in which connection the majority of children before the operation got nasopharynx sanation.

The variations of stapedoplastics were used depending on topographic and anatomical peculiarities and nature of pathological process in the drum cavity.

8 children out of 24 had dry perforative otitis. 5 out of 8 had small perforations and miringoplastics was carried out by bringing together the ends of meatotympal tissues, the perforation in the case of remaining 3 children occupied almost the whole parstensa; the miringoplastics was carried out either with free skin tissue taken from the rear surface of helix or by venous transplantant.

One of the peculiarities of children's operation on labyrinth slots is the absence of clinical indications of labyrinth irritation both during the operation and after it.

Apparently, it can be explained by age specifics. The investigation of labyrinth function shows that all children had relative hipofunction of labyrinth. In this connection we were not to prescribe any medicine after the operation to diminish features of labyrinth irritation.

It is important to note that in majority cases of sick children with otosclerosis, adhesive middle otitis and even Kochlear neuritis they do not complain about noise.

Except generally admitted method of local anaesthesia it is advisable to prescribe for children during a week before the operation "junior" types of tranquilizers - andaskin, trioksazin and to carry out an operation after premedication by aminazin, promedol, pypalphen, atropin in different variations.

The premedication removes the feeling of fear before the operation. We never postponed or interrupted the operation because of nervousness of a child.

The important factor is the preliminary contact of a doctor with a child to be operated.

The post operational period is taking its normal cause. Patients were discharged from hospital in 10-18 days after the operation depending on stapedoplastics variation.

Analysis of functional results of performed operations prove the advisability of surgical interference in cases with children having otosclerosis and adhesive middle otitis.

The further working out of evidences and investigation of hearing improvement operations peculiarities on children should be continued.

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MODERN ACOUSTICAL REHABILITATION OF THE DEAF
/The paper/

As a result of the development of electro-acoustic instruments during and after the second world war, and the electro-acoustic advances made in connexion with space programmes, we now possess high quality instruments for our treatment of deaf and hard-of-hearing patients. Current problems in the rehabilitation of persons with defective hearing are not of a technical nature, but primarily administrative and economic problems.

In the following, I will draw upon my own experience, gained through 15 years of work in the Danish welfare system, to create a background for the points and principles which should be questioned and discussed prior to the development of a future system for modern treatment of deaf and hard-of-hearing patients.

The Audiological Service in Denmark

This service is based on a law passed by the Danish Parliament in 1950. The most characteristic feature of the law is the principle then introduced for the first time: The rehabilitation of people with a hearing defect is to be provided equally to all age groups, without relation to the pernson's work capacity. In other words, normal hearing function was considered to be a human right. This view

was brought about with the cooperation of the Association of the Hard-of-hearing, and gave Denmark the same type of audiological service as had earlier been established in the United Kingdom. In some countries, where other welfare systems are established, economic aid is still provided only to persons under the age of 20 years.

The audiological service in Denmark is based on three State Hearing Centres, distributed so that each centre serves about one third of the population.

Since 1950, this service has treated about 90,000 persons with defective hearing, from a population of 4,7 million in 1966.

The State Hearing Centre in Aarhus, serves a population of about 1,4 million persons. It is located in a hospital and closely connected with an E-N-T department. Since 1960 the Centre is supplemented with four audiological clinics at the district hospitals of an administrative region.

Some Statistical Data

The amount of audiological work performed by various sorts of otologist can be illustrated with statistical analysis of Danish patient groups visiting the E-N-T specialist, the E-N-T department, and the audiological clinic.

Audiology and the E-N-T Specialist

In a district with 180,000 inhabitants, three otologists registered their work during a period of three months /1961/: Of 5,755 consultations, 122 /2%/ were school children with hearing problems. Audiometry was performed on 1,116 /19%/ of the patients, and 112 /2%/ were referred to the audiological clinic.

This means that one fifth of all patients in an ordinary consultation at the otologist have hearing problems which indicate the need for audiometric examination, whereas only 1/50 have to be referred for special examination and treatment with hearing aids.

Audiology and the E-N-T Department:

The occurrence of audiometry in the E-N-T department has been examined over a period of three months /1961/ in two district hospitals, and correlated with the fact that one of these E-N-T departments is associated with an audiological clinic while the other is not.

	WITH audiological Clinic	WITHOUT Audiological Clinic
E-N-T beds:	56	52
E-N-T patients:	753	690
Audiometry:	70 per cent	25 per cent
Referred to the Audiological Clinic:	21 per cent	1 per cent

These statistics indicate that the occurrance of audiometry in the E-N-T department varies from 25 to 70 per cent, according to whether or not there is an established collaboration with an audiological clinic, while the number of patients referred to diagnostic and therapeutic procedures at the audiological clinic is very dependent upon easy access to this assistance.

The survey also included the other departments of the two district hospitals, and it indicated that for all departments excepting the E-N-T department, the occurance of audiometric hearing examination was 30 per cent in the hospital with an audiological clinic, and 4 per cent in the hospital without such a clinic. This indicates that the establishment in a hospital of a special clinic for hearing will direct attention toward the incidence of hard-of-hearing individuals among the patients in all departments.

Audiology and the Audiological Institutions:

The number of persons who appealed for help from the audiological service in the Aarhus district, which has a population of 1,4 million, is illustrated by a statistical

survey of a oneyear period /1965-1966/, where 5415 out-patients were examined.

Age Group	MALE First exam.	MALE Re-exam.	FEMALE First exam.	FEMALE Re-exam.	Total	Per cent
0 to 14 years	131	42	95	24	292	5,4
15 to 64 -	605	269	518	299	1691	31,2
over 65 -	1184	660	999	589	3432	63,4
Total:	1920	971	1612	912	5415	100,0

Of the 5415 people who appealed for help from the audiological service, nearly one half were called to the Centre, and the remaining half were summoned to the nearest of the four satellite centres.

The high rate of re-examination - nearly one third of the total sample - among patients who are already being treated with hearing aids emphasizes the aptness of the axioms "Once treated with a hearing aid, always with a hearing aid.". This requires that the treatment be followed up, and new devices supplied as needed after four to five years. This is an important factor, as it leads to the need for a steadily increasing capacity in the audiological service, in order to provide both follow-up therapy as well as for treatment of the increasing number of new patients.

All of the audiological clinics established at hospitals must be able to handle two different groups of patients: in-patients and out-patients. At the centre in Aarhus, which is located in the University Hospital /827 beds and about 24,000 in-patients per year/, the number of in-patients treated in the centre during the year 1965-1966 amounted to 784, or about 12 per cent of the total number of patients treated at the centre.

Staff and Equipment at the Centre

The staff of the State Hearing Centre, which serves as the nucleus for the four satellite clinics, consists of 26 persons: three physicians, two hearing therapists, one administrator, three audio secretaries, one nurse, ten secretaries, and six technicians.

The centre, established in a suite beneath the E-N-T department and covering 600 square metres, is equipped with three acoustic boxes, a workshop for hearing aids, ear-mould production, and rooms for doctors, hearing therapists, administration, etc.

The Principles of the Audiological Service in Denmark

The principle that hearing is a human right, which is the spirit of the law of 1950, is secured by the fact that the patient can use the audiological service without any real economic problem. The hearing aids are provided free of charge to patients examined at the centres and audiological clinics, where the type of appliance required for their acoustic rehabilitation is determined by an otologist specialized in audiology. In respect to the aforementioned statistics, this indicates that the surveys should give a realistic picture of the need for audiological treatment in a population.

Another advantage of this system lies in the prescription of the hearing aids delivered by the clinics. The type and model of the device chosen for the specific patient is determined by the medical and pedagogic judgement made on the basis of the hearing examination in each individual case. The different sorts and models of hearing aid are purchased in quantity by the insurance association, according to the directions of the centres and their department for technical research. Due to these large purchase orders, the manufacturers achieve a very rational production, resulting in low prices for these mass-produced hearing aids.

Furthermore, technical control and inspection at the centres insures that quality is maintained at the highest possible level.

Ear moulds are produced at the clinics without charge, and the problem of electrical power for the hearing aids is solved either through the delivery of re-charging units or new batteries, both of which are free of charge. Hearing-aid repairs costing more than £ 2/10 are also covered by the insurance association. This ensures that the daily use of the hearing aid is not determined by the economic status of the user.

The very important problem of providing training to the hearing-aid user is solved through the efforts of hearing therapists distributed throughout the country. The well-distributed training service is free, and provides the patient with technical help in the use of the hearing aid, special lessons in hearing training, lip reading, and, where needed in cases of very severe hearing defects, training in the use of a special sign system /lip-hand system, Forchammer/. The severely-affected patient can be referred to two hearing sanatoria for stays of weeks or months, for special training, psychological help, and vocational training.

Audiological Treatment at the Centre in Aarhus

During the past two or three years, there has been an increasing understanding of the need for the establishment of binaural hearing. This principle has been in force for the past ten years, where we have provided all children under the age of 14 years with an aid for both the right and left ear in all cases of bilateral hearing defects. Apart from ensuring that the child always has at least one functional aid, this treatment provides the child with the possibility of sensing hearing interference between the two ears, and some directional hearing.

The development of ear-level hearing aids, either as hearing spectacles, or the so-called ear-hangers having a microphone in the body of the miniature aid behind the ear, and either internal receiver or external receiver attached to the ordinary earmould, has given the physician the opportunity of placing the microphone and amplifier in the normal hearing channel.

The first ear-level aid was developed in 1960, and the statistics collected since then, regarding the relationship between the prescription of body aid and ear-level aid, provide the following data:

Year	Body Aid	Ear-level Aid
1962	75 per cent	25 per cent
1966	20 per cent	80 per cent

As we have noted above, the occurance of binaural hearing aid treatment has increased, and this year's data concerning the prescription of the various kinds of monaural or binaural hearing aids are as follows:

Statistics of kinds of hearing aids

Ear-level Aid		Body Aid
Ear-hangers:	55 per cent	
Hearing-spectacles:	24 per cent	21 per cent
Total:	79 per cent	21 per cent

Statistics of kinds of hearing aid model prescribed through March 1967 at the State Hearing Centre, Aarhus.
Prescribed binaural to 90 per cent of the patients.

Since January, 1967, it has been a routine principle that we do not consider hearing aid treatment to be sufficient until the patient has proved the hearing aids on both the right and left ears for a period of at least three

months. This procedure is made possible by the support which can be given the patient through the training service, whereby the hearing therapist can provide group or individual therapy in the home, if necessary. The attempt can be made, with a high probability of success, of convincing the patient and his closest family and friends that both of the aids should be used at all times, just as one uses binocular spectacles.

Patients with very severe hearing defects /i.e., over 60 or 70 db. at the speech frequencies: 500, 1000, and 2000 cps./ are provided with body-type hearing aids where satisfactory treatment cannot be achieved with ear-level aids. In order to stimulate both ears, the body aid is connected to both ears through the use of a Y-cord and a receiver in each ear. Patients having a different degree of severe hearing defect in each ear are provided with two body-type aids; one for each ear.

Apart from the above-mentioned electro-acoustic treatment of deaf and hard-of-hearing patients, surgical therapy can be indicated in approximately 10 to 15 per cent of all cases of defective hearing. Patients with defective hearing resulting from otosclerosis or chronic otitis media are selected for middle-ear surgery, which often, especially in cases of otosclerosis, produces very good hearing. After such a patient has been operated upon in one ear, a hearing aid is provided for the other ear until it too can be treated surgically.

Summary:

In the general population, one or two per cent have sufficiently defective hearing as to require treatment with hearing aids.

This treatment being a part of the otological disciplin needs establishment of audiological clinics as a part of, or work in close connection with an ordinary E-N-T department. About 20 per cent of all patients in the E-N-T department should be referred to the audiological clinic conducted by an otologist specialized in audiology.

Babies and children with congenital hearing defects, or defects acquired at an early age, should be provided with hearing aids in both ears as early as possible. With the aid of their hearing devices, language bombardment will enable them to develop their mother tongue to such an extent that they will later be able to attend special classes in the ordinary school. They will thus be able to remain in their own homes, attend school with their own neighbourhood playmates, and thereby become better adapted to normal life while further developing their ability to understand and use speech and language.

In 75 per cent of the patients binaural ear-level hearing aids, either as hearing spectacles or ear-hangers, are indicated for cases with thresholds of hearing which do not exceed 60-70 db.

In 25 per cent of the patients body-type hearing aids are indicated, used either singly with a Y-cord or in pairs, providing the patient with better hearing through the creation of interference between the peripheral hearing organs.

15 per cent of all patients with hearing defects have middle ear diseases where surgery may be indicated either alone or supplemented with hearing aid therapy.

The world hearing situation is characterized by the fact that there are about 60 million deaf and hard-of-hearing individuals in the world to-day, while the world

production of hearing aids is only about 1,4 million units per year.

The goal must be the establishment of mass production of throw-away hearing aids; hearing aids so inexpensive that they may be thrown away when they go out of order, to be replaced by a new unit given to the patient. It is impossible to establish a world-wide system of service and repair of the aids.

The most important step in providing modern audiological rehabilitation for every deaf and hard-of-hearing person in the world is the acceptance of this individual as being a patient, as every other person with a disease or handicap. The acceptance that the hearing aid is a part of the medical remedy prescribed by the physicians - without limitations caused by the cost of the aids. This attitude towards the deaf and hard-of-hearing individual will in the years to come mean a break-through for the principle that "Normal hearing is a human right".